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FORGING METHOD  
[TANZO HOHO]

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[Title of Invention] Forging method

[Scope of Patent Claims]

[Claim 1]The forging method is characterized in that after the metal material is casted into the nearly forged product form, that casting product is forged, the forged product is obtained in this method. An intermediate part is placed in the part corresponding to the undercut part of the forged product and casted, the casted product is forged casting around that intermediate part, and then, the intermediate part is removed.

[Detailed explanation of the invention]

[0001]

[Industrial field of use] The invention pertains to the forging method. In particular, it pertains to the method where the metal material is casted and then forged.

[0002] A type of forging method wherein the metal material is casted in the nearly forged product form, then, that casted product is forged. For example, a forging method for forging the alumi casted product was disclosed in Patent Publication no. 62-187539. By forging the casted product in the nearly forged product form, the forged product of the

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<sup>1</sup> the numbers in the margin indicate pagination in foreign text

desired mold can be obtained easily as compared to the case when only the forging is performed. Also, by forming the forged flow line produced inside the forged product across the forged product shape, the product can be obtained with excellent mechanical strength.

[0003]

[The problems resolved by the invention] However, when the forged product has an undercut part, the forging is implemented for molding the casted product, then, since the undercut is formed by the grinding process and the hole processing in that forged product, the work is increased and the material property is reduced, the cost of production is increased which is a problem. Also, since the forged flow line is cut by implementing the hole process in the forging product, the strength of the product after the mechanical process is reduced which is a problem.

[0004] On the other hand, by providing the undercut formation part in the casting mold, the casted product having the undercut part is formed. That casted product is forged dividing into several steps but the number of forging process is increased, the efficiency is reduced, the forging set up cost is increased which is undesirable.

[0005] The invention focused on the above problems and offer a method that can forge the cast product having the undercut part easily and economically.

[0006]

[Means for resolving the problems] Then, the gist of the invention is to place an intermediate part in the part corresponding to the undercut part of the forged product and casting is performed. The casted product is forged and the intermediate part is removed.

[0007]

[Action] The casted product of the state wherein the casting is around the intermediate part, the forging is obtained similar to the casted product, the intermediate part is removed after the forging, the forged product having the undercut part can be obtained.

[0008]

[Effect of Invention] Therefore, it is not necessary to implement the hole implementing process in the forged product to form the undercut part like in the conventional technology, the effect of improving the material properties and reducing the work load can be obtained. Also, since the forge flow line is not cut, the strength reduction of the product after the mechanical processing can be prevented. After the forging, comparing to the case when the undercut

part is formed with the grinding work, the product with excellent mechanical properties can be obtained, like the impact strength, the tensile strength, the resistant force, elongation, etc. In addition, the general casting device and forging device can be used. Since the number of forging processes is reduced, the machine cost can be controlled.

[0009]

[Implementation example] An implementation example is explained in detail based on the diagram. The invention is applied to the forging method of the A shape suspension arm made of aluminum alloy. As shown in figure 5, the suspension arm 10, a manufacture product is provided with 3 boss parts 12, 14 and 16. The A shape is formed connecting respectively the boss part 12 and the boss part 16 by the connection part 18 and the boss part 14 and the boss part 16 by the connection part 20. Through holes 22, 24 are formed protruding in the horizontal direction into the boss parts 12, 14. Through hole 26 is formed protruding in the perpendicular direction into the boss part 16. Also, the protruding groove 28 is formed in the respective longitudinal directions in both connection parts 18, 20.

[0010] In figure 2, 30 is the metal mold of forging device. The metal mold 30 is made up of an upper mold 32 and a lower mold 34, cavity 36 is formed by both molds 32, 34.

Cavity 36 is formed into the shape of the suspension arm 10. The molten path 38 is formed in the upper mold 32. The molten metal flows into the cavity 36 from the molten path 38.

[0011] Also, in figure 4, 42 is the upper mold of the forging device, 44 is the lower mold. The upper mold 42 approaches and separates in the lower mold 44 by the drive device that is not shown, the forging is performed by the mold surface 46, 48 of both molds 42, 44.

[0012] The forging method of the suspension arm 10 is explained. Since the through holes 22, 24 of the boss parts 12, 14 are the undercut parts, first, as shown in figure 2, 2 intermediate parts 50 are arranged in the cavity 36 of the metal mold 30. This intermediate part 50 is made of metal such as alloy tool steel SKD61. A molded part 52 is provided forming slight taper at the outer peripheral surface. After coating a separating agent of black lead at the outer peripheral surface of the formation part 52 of the intermediate part 50, the formation part 52 is placed partially corresponding to the through holes 22, 24 of the suspension arm 10 and maintained by wood of large diameter 54(refer to figure 1 and 3).

[0013] Next, the molten aluminum alloy is flowed into the cavity 36 via the molten path 38 from the molten metal device which is not shown, the casting is performed.

[0014] After the casting, the upper mold 32 and the lower mold 34 are separated, the casted product 60 is taken out, the plan part is removed. As shown in figure 3, the molded parts 52 of the respective intermediate parts 50 are casted into the boss parts 62, 64 of the casted product 60. The concave part is formed in the boss part 66 in this state; the groove is not formed in the connection parts 66, 68.

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[0015] Next, the casted product 60 casted with the intermediate part 50 is placed on top of the lower mold 44 of the forging device shown in figure 4. The forging is performed by moving the upper mold 42 vertically by a drive device. The through hole 26 is formed in the boss part 66 by both mold surfaces 46, 48, the respective grooves 28 are formed in the connection parts 66, 68.

[0016] The suspension material (casted product) 72 right after forging is shown in figure 1. It is clear from the diagram that bur 70 is produced by the excess material surrounding the suspension material 72 by the forging. The molding part 52 of the intermediate part 50 is covered temporarily by this bur 70 but there is no change.



[0017] After the suspension arm material 72 is taken out from the forging device after the forging, the intermediate part 50 is pulled out from the boss parts 12, 14, the molded part 52 of the intermediate part 50 becomes slightly tapered. In addition, since the separating agent is coated, it can be extracted easily. The through holes 22, 24 are formed after the intermediate part 50 is extracted. Since the intermediate part 50 has excellent heat resistance, durability, etc. after it is extracted from the suspension arm material 72; it can be re-used for the next forging.

[0018] Then, the bur 70 is removed by the press device not shown. A suspension arm 10 shown in figure 5 is obtained by finishing up with the mechanical processing.

[0019] Furthermore, in the implementation example, the tip of the molded part 52 of the intermediate part 50 become elongated not protruding from the through holes 22, 24 of the boss parts 12, 14 but by elongating protruding from the boss parts 12, 14, the molded part 52 is not covered by the bur 70.

[0020] Also, it is preferred that the intermediate part is extracted corresponding to the shape of the forged product. When the intermediate part is used only once, the intermediate part is ground from the forged product.

[0021] In addition, the invention can be implemented in other variations and at the improved state based on the knowledge of that profession.

[Brief description of the diagrams]

[Figure 1] This diagram shows the forged product forged by the forging method which is an implementation example of the invention.

[Figure 2] This is the front view showing the work process of the aforementioned forging method.

[Figure 3] This is the diagram showing the forged product molded by the work process of the aforementioned forging method.

[Figure 4] This is the front view cross section showing another process of the aforementioned forging method.

[Figure 5] This is the diagram showing the manufacture product implemented with the finishing process on the forged product of figure 1.

[Description of the symbols]

10 suspension arm

22 through hole

24 through hole

30 metal mold

36 cavity

42 upper mold

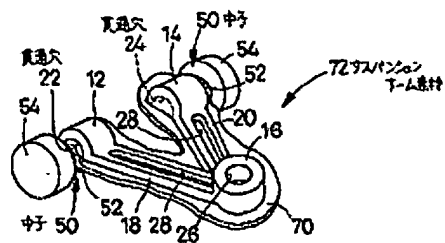
44 lower mold

50 intermediate part

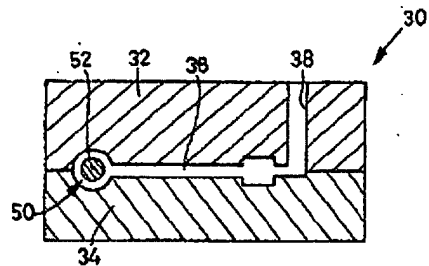
60 forged product

72 suspension arm material

[Figure 1]



[Figure 2]



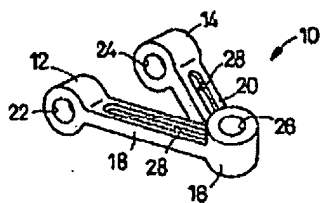
22 - through hole

24 - through hole

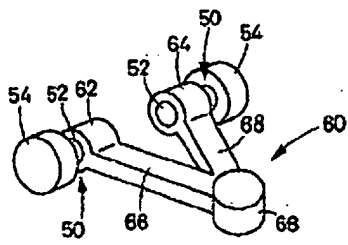
50 intermediate part

72 - suspension material

[Figure 5]



[Figure 3]



[Figure 4]

